Castilleja

The Newsletter of the Wyoming Native Plant Society

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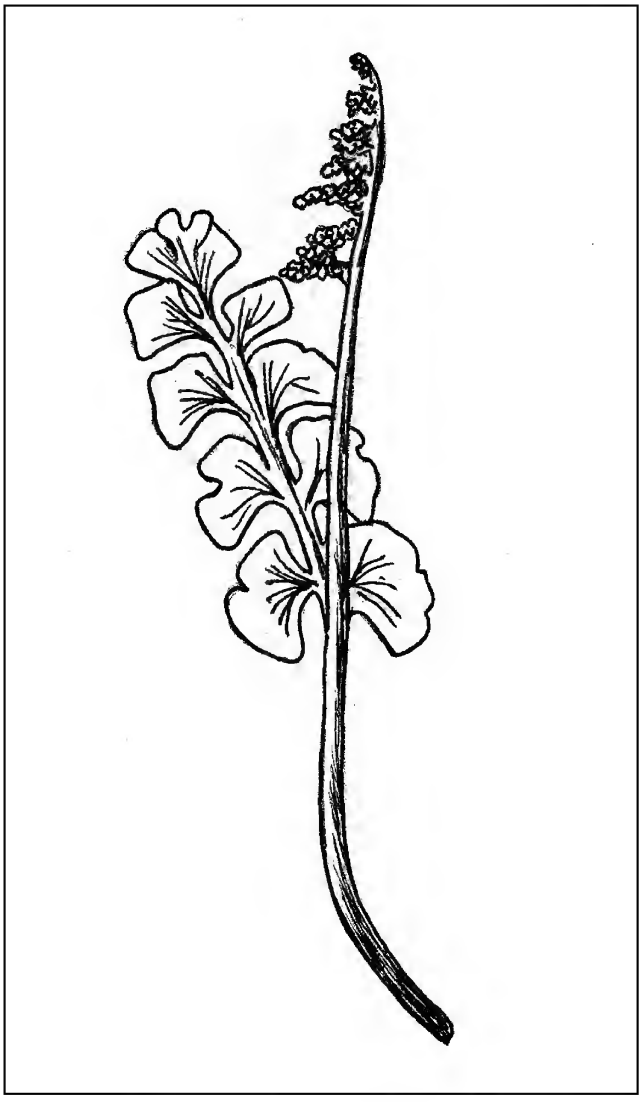

Moonwort (*Botrychium lunaria)* is one of nearly a dozen species of *Botrychium* known or reported for Wyoming. It can be recognized by its overlapping, fan-shaped fleshy leaflets and bead-like fertile leaf segments. In Wyoming, moonwort is uncommonly seen in moist meadows forest edges, and alpine scree slopes in the Absaroka, Gros Ventre, Wind River, Bighorn, and Medicine Bow ranges.

Moonworts were a specialty of the late Dr. Warren "Herb" Wagner of the University of Michigan, who described 13 of the 30 taxa recognized in the 1993 treatment of the genus in the *Flora of North America*. Wagner was also famous for unraveling many of the intricacies of hybridization and reticulate evolution in *Asplenium* and other plants and for conceptual advances in systematics, such as the "Wagner Groundplan-Divergence" method of assessing phylogenetic relationships. Wagner passed away in January at the age of 79. Illustration by Walter Fertig.

WNPS NEWS

Scholarship Winners: The WNPS Board is pleased to announce that three University of Wyoming botany graduate students have been awarded scholarships for the 1999-2000 academic year. Mark Lyford of Laramie was awarded the top prize of $300 for his proposal on "Holocene migration of Utah juniper (*Juniperus osteosperma*) in Wyoming". Stephen Gray of Laramie and Jodi Norris of Cheyenne split the second-place prize ($280 apiece). Stephen is studying "Tree-ring based reconstructions of climate variability in the eastern Greater Yellowstone region" and Jodi is working on "Ponderosa pine biogeography". The WNPS annual scholarship is completely funded through the generous donations of members of the Society. Thanks to all who have contributed in the past year.

2000 WNPS Field Trips: The Society's annual meeting is scheduled for the weekend of June 17-18 in the Shirley Basin and surrounding mountains of central Wyoming. Plan to meet at the state rest area near the junction of highways 487 and 77 on Saturday morning (June 17) at 8:30 AM for a brief business meeting in the parking area. From here, we will proceed to Chalk Mountain to observe a variety of unusual cushion plant species, including the state endemic *Sphaeromeria simplex* (Laramie false sagebrush) and showy wildflowers. We also plan to explore the Agate Flats area for spring cushion plants and Shirley Mountain (weather permitting). For those who wish to continue on Sunday, we will be camping out Saturday night on Chalk Mountain or Shirley Mountain.

In July, WNPS will be holding a joint field trip with the Great Plains Wildflower Society to explore the Black Hills of South Dakota and NE Wyoming. There will be more details on this outing in the May newsletter, which will be a special theme issue addressing the Black Hills region.

WNPS Elections: Once again, it is time to find interested people willing to serve on the WNPS board. If you are interested, or know of someone who should run, please contact the Secretary-Treasurer. A ballot and renewal notice will appear in the May issue.

New Mailing Address: Please note that the Society has changed its mailing address to PO Box 3452, Laramie WY, 82071.

New Members: Please welcome the following new members of WNPS: Linda Anderson (Chugwater), Peter Guernsey (Laramie), Lois Hansen (Cheyenne), Renee Meador (Sheridan), and Katherine Nelson (Cody).

We're looking for new members: Do you know someone who would be interested in joining WNPS? Send their name or encourage them to contact the Society for a complimentary newsletter.

Attention Readers: We are always looking for articles and illustrations for the newsletter. Items for the May issue are needed by 6 May 2000.

Treasurer's Report: Balance as of 26 March 2000: General Fund $615.74; 2000-2001 Student Scholarship Fund $0.00; Total funds: 615.74

Wyoming Native Plant Society
PO Box 3452, Laramie, WY 82071

President: Jim Ozenberger (Jackson)
Vice President: Amy Roderick (Laramie)
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Teton Chapter: PO Box 82, Wilson, WY 83014 (Joan Lucas, Treasurer).

Contributors to this issue: Dave Culp, Jean Daly (JD), Jane Dorn, Robert Dorn, Walter Fertig (WF), Brandi Hoster, Isobel Nichols, and Richard Scott.

Botany Briefs

Arabis pusilla Dropped from Candidate List: The US Fish and Wildlife Service issued its latest list of candidate species for potential listing under the Endangered Species Act on 25 October 1999. Missing from the list was *Arabis pusilla* (Small rockcress), which had been a candidate since 1985. Small rockcress is a localized endemic restricted to outcrops of pegmatitic granite near South Pass, Wyoming. Barbara Amidon (formerly of the Rock Springs BLM and a past president of WNPS) initiated a Habitat Management Plan for this species on BLM lands in 1994 and helped secure a mineral withdrawal for the site and ACEC designation for its limited range in 1997 (see *Castilleja*, December 1997). Due to these management steps, the USFWS determined that Small rockcress was no longer in need of listing under the Endangered Species Act. WF

C.L. Porter: Cedric L. Porter, longtime curator and successor of Aven Nelson at the Rocky Mountain Herbarium (RM), passed away on 8 January 2000. Porter was born into a missionary family in present-day Pakistan in 1905. He earned degrees in Botany from the

University of Michigan and University of Washington, where he initially specialized in the taxonomy of bryophytes, but broadened his academic interests to vascular plants when he accepted the position of curator of the RM in 1942. Porter is perhaps best known as the author of *Taxonomy of Flowering Plants*, a popular systematics text in the 1960s and for initiating the *Flora of Wyoming* pamphlet series in 1962. He is also well-known for traversing the state in an air-stream trailer to collect plants for the herbarium and documented several new state records (mostly in the Black Hills and among Wyoming's aquatic flora). One of Porter's most interesting discoveries was an endemic sagebrush from the Wind River Basin named *Artemisia porteri* in his honor by Arthur Cronquist in 1951. Porter and his collecting partner/wife Marjorie retired to Arizona in 1968. Sadly, Marjorie Porter herself passed away in March. WF

Six Research Natural Areas and Special Interest Areas Designated on Bridger-Teton National Forest

After several years of study and review, Bridger-Teton National Forest officially designated 4 new Research Natural Areas (RNAs) and 2 new Special Interest Areas (SIAs) in December 1999. RNAs and SIAs are sites of unusually important biological significance or good examples of common vegetation types that are managed in a largely undisturbed condition in order to provide reference areas for long-term scientific studies. These sites remain open to most recreational activities and other resource uses that are compatible with the biological management goals for the area. The new RNAs and SIAs are:

Afton Front RNA (located in the Salt River Range just east of Afton)
Gros Ventre RNA (located in the Gros Ventre Range SE of Jackson)
Osborn Mountain RNA (located in the Wind River Range and visited during WNPS' 1998 annual field trip)
Swift Creek RNA (located in the Salt River Range east of Afton and featured in the December 1994 *Castilleja*)
Big Fall Creek SIA (Wyoming Range west of La Barge and featured in the December 1997 *Castilleja*)
Kendall Warm Springs SIA (along the Green River NW of Pinedale and featured in the October 1995 *Castilleja*). WF

Revolutionary New Taxonomy Sheds Light on Plant Kingdom

Will Enhance Photosynthesis and Cure Greenhouse Effect

By Dave Culp

With all due apologies to Arthur Cronquist, the current method of plant classification used in most modern herbaria is cumbersome at best. After working in the Rocky Mountain Herbarium (number 17 and growing!) I have developed a simplified method of plant classification to be known as the Culp Method of Filing Plant Corpses.

The main problem with Art's system lies in the families: there are too many of them. The Culp Method of Filing Plant Corpses utilizes only seven families.

In keeping with Art's tradition, we start first with primitive plants. The first family is the Mossiaceae. Plants in the Mossiaceae family are characterized by being short, slimy, and generally gross. Members of this family are also readily identifiable by using the Animal Method: If it looks like something the cat drug in, and the dog was afraid to drag back out, its in the Mossiaceae.

Our second family is the Ferniaceae. There is only one criteria for membership in this family: If it hangs in A fern bar it's a Ferniaceae. Ferniaceae is probably one of the most fun families to study because of its habitat.

Moving up the evolutionary ladder, we come to the Grassiaceae. These plants are very easily identified. If it has long, very thin leaves, tries to cover as much ground as possible, and survives after being run over by machines with whirling blades and the name "Toro" painted on them, it belongs in the Grassiaceae.

The next family is the largest. It is the Floweriaceae. This family includes any plant that exists to produce a flower. By flower, we mean a showy plant part that, when presented to your spouse, will probably win you forgiveness for an all night session at the fern bar.

The larger plants of the world fall into one of two families. These families are the Bushiaceae and the Treeiaceae. Both of these families have members that grow tall. Members of the Bushiaceae, however, have branches very low to the ground and are often found around foundations of buildings. Plants of the Tree-iaceae don't have low branches and generally live further away from buildings.

Our final family is the most painful and dangerous to study. It is the Cockleburriaceae. Members of this family can be placed into one of two subfamilies: Dog Hair Cloggus or Bicycle Tire Eatus. Members of the Cockleburriaceae are identified by their spins, thorns, and other lethal projections. If you pick up a plant and say "ouch," it's probably a member of the Cockleburriaceae. Placement into the two subfamilies is easy: throw it at your dog. If it gets stuck in its hair, it's a Dog Hair Cloggus. The next test involves a bicycle. If it causes a flat tire after being run over by the bicycle, it goes into the Bicycle Tire Eatus subfamily.

Use of the Culp Method of Filing Plant Corpses will help most herbaria overcome their difficulties in filing specimens. It should also create lots of debate and frantic research among plant taxonomists. This will create hordes of jobs, stimulate the economy, help establish a new world order, and bring peace to the world. At the very least, it will make working in an herbarium a whole lot easier.

Editor's Note: The author formerly worked at the Rocky Mountain Herbarium at the University of Wyoming. He was fired after refiling the entire collection using the Culp Method.

On the Germination and Viability of *Yermo xanthocephalus* Akenes

By Richard Scott and Brandi Hoster
Central Wyoming College, Riverton, WY

In this report we present a technique for germinating the akenes of *Yermo xanthocephalus* Dorn, the Desert Yellowhead. This taxon was only recently described as a new species and genus in the tribe Senecioneae, possibly allied with the genus *Cacalia* L., section Conophora, by Dorn (1991). At the time, Dorn noted a history of disagreement as to the status of *Cacalia* and other cacalioid genera. Most recently, in preparation for the *Flora of North America North of Mexico*, the genus has been included in the subtribe Tussilagininae (Cass.) Dumort. along with other segregate genera, some of which represent the now- rejected *Cacalia* L. (Barkley 1999). *Yermo* and other members of its subtribe are now appropriately referred to as the "tussilaginoids".

The species has an extremely restricted distribution pattern, occurring on a 2.4 ha (< 6 acre) site in eastern Fremont County, Wyoming at 6730 ft. The population has fluctuated from 9293 plants to 12099 plants in the census years between 1995- 1999. The species was proposed for listing as Threatened by the U. S. Fish and Wildlife Service (USDI 1998) in December 1998 and is the subject of a comprehensive management plan by the Bureau of Land Management (Breckenridge 1999). As might be expected, the listing and proposed management activities have been met with a certain amount of controversy (Hafner 1999, 2000).

In view of the small population size, and as part of an ongoing study on the population dynamics, habitat requirements, and community associates of *Yermo xanthocephalus*, we undertook a series of germination experiments to determine the viability of *Yermo* akenes. The results will eventually be used in a population growth model. It had been noted much earlier in our work that only a few akenes per head developed and had the appearance of viability. The remainder were considered non-fertile. We now know there is a distinct size and weight difference between the fertile and non-fertile akenes (Table 1). For this report, fertile akenes were collected at the *Yermo* site as maturation occurred in late August and early September 1998 and 1999. The akenes were then germinated in the laboratory in order to examine seed viability.

The experimental procedure was a technique used in cytogenetics, based on that of Brown (1998), in which air is bubbled through water-filled flasks containing the akenes. The flasks were aerated with a multi- outlet aquarium pump and valve system so that equal amounts of air were delivered to each flask. For each run, two temperature dataloggers measured average water temperature at ten-minute intervals in two of the flasks. The experimental apparatus was housed in a Biotronette Mark III Environmental Chamber set for a 12-hour photoperiod. Three runs were conducted during the period of September to December, 1999. Duration of the runs was either 24 or 25 days. The runs were set up as follows:

Table I
Akene Characteristics

	Viable		
	Length (mm)	Width (mm)	Weight (g)
Maximum	7.5	2.5	0.014
Minimum	5.5	1.5	0.002
Average	6.725	2.15	0.083
		Nonviable	
	Length (mm)	Width (mm)	Weight (g)
Maximum	4.0	1.5	-----
Minimum	3.0	1.0	-----
Average	3.4	1.1	0.003

Run 1: Eight 250ml flasks were each filled with 150ml of distilled water, and bubble stones were inserted to provide aeration. Four of these flasks contained 1998 akenes and the other four contained 1999 akenes. Ten akenes were placed in each flask. The 250ml flasks proved to be too big to allow vigorous aeration of the akenes, so were replaced with 50ml flasks, and the bubble stones were removed. Water in the smaller flasks quickly evaporated, so these were replaced with 125ml flasks filled with 100ml of distilled water. This size was satisfactory, although water had to be added every three days to maintain 100ml. Eventually the water was totally replaced with fresh water at these times to retard microbial contamination. Toward the end of the run, 1:720 Natriphene (sodium o-phenylphenate) was sprayed into the flasks to help retard microbial growth. Run 1 was terminated after 24 days due to lack of further germination activity. Run 2: The experimental setup was the same as the final setup for Run 1. All flasks were initially sprayed with Natriphene for microbial control. Due to evaporation, the flasks were brought up to 100ml every three days and sprayed with Natriphene. The length of Run 2 was 25 days. Run 3: The experimental setup was the same as Run 2. The length of Run 3 was 24 days.

Results

Due to the 12-hour photoperiodic regime, temperatures fluctuated approximately 4-6°C on a 24-hr basis. High temperatures were in the 20- 22°C range, while low temperatures varied between 15-17°C. Average temperature in all runs varied between 19.53°C and 18.26°C, a maximum difference of only 1.27°C over a 23- day measurement period for all runs. Since one datalogger recorded temperatures for 1999 runs and the other recorded 1998 runs, we have concluded that temperature has not played a significant role in

germination differences noted between flasks during each of the three runs (Table II).

Table II
Germination Water Temperatures (°C)

	Run 1	Run 2	Run 3
	1999	1999	1999
Max	21	20.27	20.28
Min	17.07	16.37	16.19
Mean	19.06	18.26	18.26
	Run 1	**Run 2**	**Run 3**
	1998	1998	1998
Max	20.62	20.71	21.85
Min	16.6	16.9	17.65
Mean	18.65	18.75	19.53

We used the first appearance of a white, inferior bump as evidence the radicle was erupting through the akene wall and it was thus interpreted as the first sign of germination. In a few akenes this occurred one day into the run. In others it took as long as eight days, after which the primary root began elongation. Following elongation and curvature, the akene coat was shed and the cotyledons of the young seedling were visible. Figure 1 shows development of *Yermo* akenes to the young seedling stage. We grouped this development into three stages, the first eruption of the radicle, development of the primary root and hooked curvature, and appearance of green cotyledons. These are identified as Stage I (1-9 days), Stage II (10-20 days), and Stage III (21+ days).

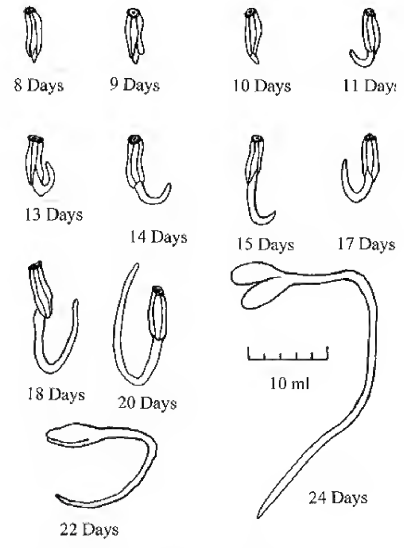
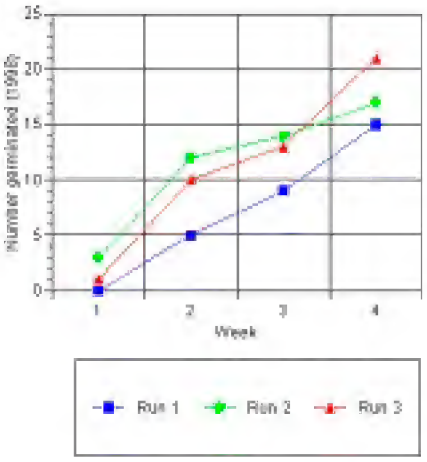
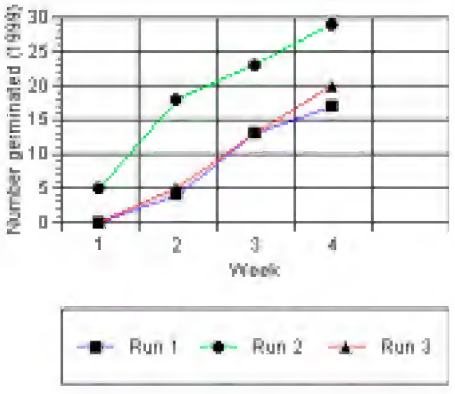


Figure 1. Development of *Yermo xanthocephalus* after akene germination. Three groups are recognized: Stage I (1-9 days); Stage II (10-20 days); Stage III (21+ days).

In all runs, more akenes germinated from the 1999 sample than the 1998 sample (Figure 2a, 2b). As a result of all runs, we were able to germinate 55% of the 1999 akenes (66 of 120) and 44% of 1998 akenes (53 of 120).



Figures 2a (above) and 2b (below). The number of 1998 and 1999 akenes germinated.

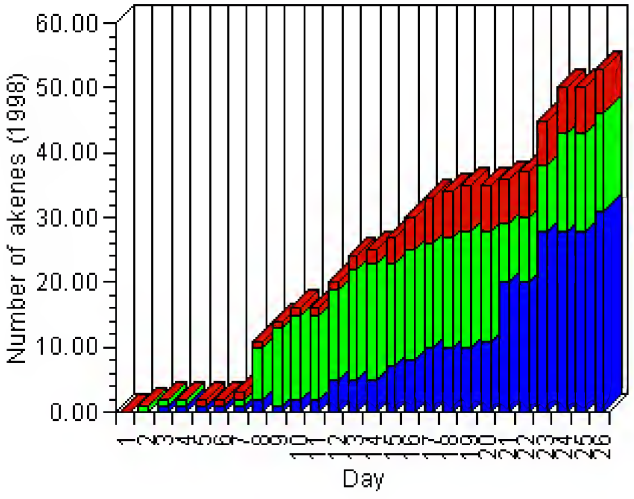


Mortality occurred in many akenes early in the germination process so that 33 of all those 1999 akenes and 31 of all those 1998 akenes at Stage I died. As a result, 33 from 1999 and 22 from 1998 reached Stage II, while only 9 from 1999 and 7 from1998 reached Stage III (Figures 3a, and 3b). This pattern produced 50 % mortality in the germinated 1999 akenes and 58 % mortality in the germinated 1998 akenes. Overall, 27 % of the total 1999 sample and 18 % of the total 1998 sample reached Stage II in the germination process.

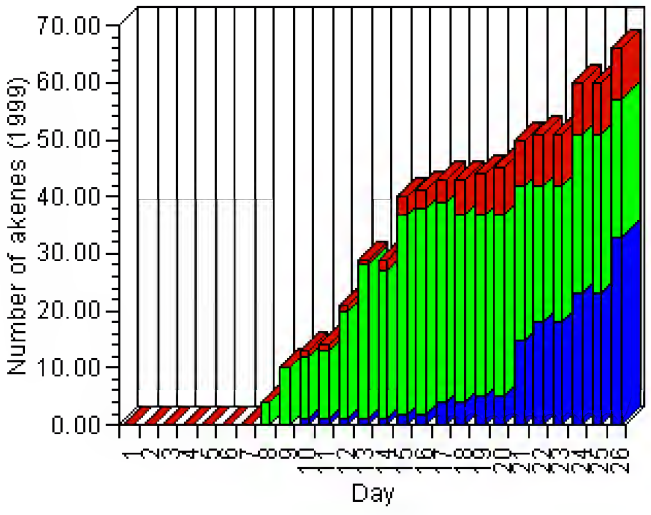
We've attributed at least a portion of this high mortality to microbial (probably fungal) infection, which occurred in spite of antibiotic treatment. The mortality may be at least partially alleviated by transplanting Stage I plants to a soil medium. For the present we have only attempted to transplant Stage III plants, and this has been successful.

Summary

We have developed a relatively easy way to check *Yermo* akenes for viability and at the same time supply a source of seedlings for transplant. The advantage of using this method is that seedlings are readily produced and are ready for potting and continued growth. The disadvantage is high mortality in the early stages of germination. This mortality is presumably due, in large part, to microbial activity. Further use and refinement of our technique will hopefully yield greater survivorship of seedlings.



Figures 3a (above), and 3b (below). Number of 1998 and 1999 akenes in the three stages of development.



Above: Desert yellowhead (*Yermo xanthocephalus*) has been proposed for listing as Threatened under the Endangered Species Act. The BLM Lander Field Office proposed withdrawing 3750 acres of potential *Yermo* habitat from locatable mineral leasing in August 1999 and is currently developing a Conservation Agreement and Strategy for this species. Illustration by Jane Dorn.

Literature Cited

Barkley, T.M. 1999. The segregates of *Senecio*, s.l., and *Cacalia*, s.l., in the Flora of North America North of Mexico. Sida 18:661-672.

Breckenridge, C. 1999. Conservation agreement, assessment and strategy (draft). USDI Bureau of Land Management and US Fish and Wildlife Service.

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Hafner, J. 1999. How to best protect rare plant? The Sunday Ranger (Sunday, 24 October 1999).

Hafner, J. 2000. Plant protection worries ranchers. The Riverton Ranger (Friday, 7 January 2000).

USDI Fish and Wildlife Service. 1998. Endangered and Threatened wildlife and plants: Proposed Threatened status for the plant *Yermo xanthocephalus*. Federal Register 63(245): 70745-70751.

Noteworthy Discoveries

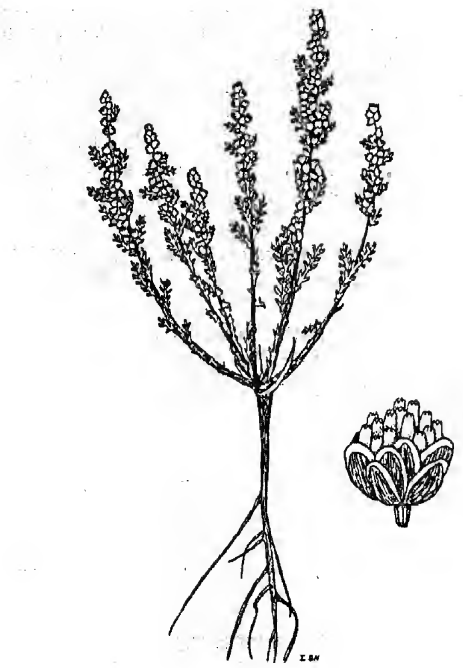
***Stephanomeria fluminea*, a New Species Endemic to Wyoming**: Aven Nelson discovered hundreds of new plant species from Wyoming and the west during his distinguished career at the University of Wyoming. But in August 1894, he collected an unusually broad-leaved specimen of *Stephanomeria tenuifolia* along Bacon Creek in the northeastern Gros Ventre Mountains which would remain unrecognized as a new species for over a century. Nelson's plant has just been described by Dr. Leslie Gottlieb of the University of California at Davis as the new taxon *Stephanomeria fluminea* (Teton wire-lettuce).

Gottlieb, an authority on the genus *Stephanomeria* (commonly called the wire-lettuces, due to their skinny leaves and lettuce-like flowers), published this new species in the journal *Madrono* in 1999. *S. fluminea* is restricted to gravel bars and creek bottoms of the Snake, Gros Ventre, and South Fork Shoshone rivers and their tributaries in Northwestern Wyoming (Park, Sublette, and Teton counties). Teton wire lettuce can be recognized by its numerous flower heads of pinkish ray flowers, erect multi-branched stems, and broad basal and stem leaves. It differs from *S. tenuifolia* primarily in having wider leaves and in its habitat affinity (*S. tenuifolia* is usually found on steep, dry, rocky slopes).

Teton wire-lettuce is currently known from 5-6 extant and 4 historical populations in the entire world. It has tentatively been ranked G2?/S2 by the Wyoming Natural Diversity Database, pending further study. The species occurs in Grand Teton National Park and Bridger-Teton and Shoshone National Forests, and is likely to be found on the National Elk Refuge. Little data currently exist on population size. WF

Reference: Gottlieb, L.D. 1999. A new species of *Stephanomeria* (Asteraceae) from northwestern Wyoming. Madrono 46(1):58-60.

Mystery Wormwood Alive and Well in Utah: *Artemisia biennis* var. *diffusa*, the so-called "Mystery wormwood" was thought to be possibly extirpated in 1998, following a comprehensive survey of potential playa habitat in SW Wyoming by the Wyoming Natural Diversity Database. Thanks to the efforts of Dr. Kim Anderson of Dixie National Forest, var. *diffusa* is now known from a small lakeshore population in southern Utah, nearly 300 hundred miles south of the only other reported population in Sweetwater County, WY. Anderson first discovered the Utah colony in 1996 and revisited the site in September 1999 to collect a voucher specimen that he sent to Dr. Robert Dorn for positive confirmation. Dorn discovered the Wyoming population in August 1980 near the Jim Bridger power plant north of Point of Rocks and described it as a new variety in 1988. Since 1980, at least 8 expeditions to relocate the species have failed, prompting fears that the plant might be extirpated. Despite the discovery in Utah, Kim Anderson reports that the species is still quite uncommon and highly threatened. Hopefully, additional surveys will be conducted in southern Utah to determine the range and abundance of the taxon there and seed will be collected to establish off-site populations. WF



Above: "Mystery wormwood" by Isobel Nichols from the Wyoming Rare Plant Field Guide.

More new plants for Wyoming: B.E. "Ernie" Nelson of the University of Wyoming's Rocky Mountain Herbarium reports the following new plant species found during explorations of eastern Wyoming in 1999:

Chenopodium incanum* var. *incanum (Silvery goosefoot). Ernie discovered this annual member of the Chenopodiaceae in a sandy blowout 4 miles east of Springer Reservoir in Goshen County. *C. incanum* resembles *C. fremontii*, but differs in having larger fruits (over 1.1 mm in diameter) that are exposed by the sepals at maturity. Var. *incanum* occurs widely across the Great Plains (often in disturbed sites), but is replaced by other varieties in the Great Basin and American Southwest.

Juncus gerardii (Blackgrass). This perennial, rhizomatous rush was discovered in a roadside wetland north of Rock River in Albany County. It resembles *J. compressus*, but has larger flowers, longer tepals, and longer anthers. Although native to eastern North America, this species has probably been introduced in the interior.

Phaseolus vulgaris (Common bean). This escaped crop plant was found along a road near Hawk Springs Reservoir in Goshen County, several miles from the nearest field. Common bean is originally native to Central America, but was widely planted by Native Americans and is one of many New World species that was introduced to Europe as a food crop. WF

The Wyoming Native Plant Society, established in 1981, is a non-profit organization dedicated to encouraging the appreciation and conservation of the native flora and plant communities of Wyoming. The Society promotes education and research on native plants of the state through its newsletter, field trips, and annual student scholarship award. Membership is open to individuals, families, or organizations with an interest in Wyoming's flora. Members receive *Castilleja*, the Society's quarterly newsletter, and may take part in all of the Society's programs and projects, including the annual meeting/field trip held each summer. Dues are $7.50 annually.

To join the Wyoming Native Plant Society, return the membership form below to:

Wyoming Native Plant Society
PO Box 3452
Laramie, WY 82071

Name:
_____

Address:
_____

___ $7.50 Regular Membership
___ $15.00 Scholarship Supporting Member
($7.50 goes to the annual scholarship fund)

Wyoming Native Plant Society
PO Box 3452
Laramie, WY 82071

Quotes: Periodically, we will insert quotes from the writings of early explorers and plant collectors who visited Wyoming. One or two plant names that commemorate the person will also be listed. Robert Dorn

Brevit Capt. John C. Fremont, U. S. Army
Senecio fremontii, Penstemon fremontii
Report of The Exploring Expedition to The Rocky Mountains.... 28th Congr., 2nd Sess., Senate Exec. Doc. No. 174:123. 1845. July 31, 1843
"As we emerged on a small tributary of the Laramie river, coming in sight of its principal stream, the flora became perfectly magnificent; and we congratulated ourselves, as we rode along our pleasant road, that we had substituted this for the uninteresting country between Laramie hills and the Sweet Water valley."

Bighorn Native Plant Society: The Bighorn Native Plant Society organized in March of this year to encourage the appreciation and conservation of native flora and plant communities in the Bighorn Mountains and adjacent plains. The society will promote education, research, and enjoyment of the Bighorn Range and surrounding area through its newsletter and web site. Membership is open to individuals with an interest in the north central Wyoming flora.

Members will receive the Bighorn Native Plant Society's newsletter (published twice a year in June and July) either through the mail or their e-mail address. Two classes and several field trips have already been organized for this summer. Annual membership is $5.00. To join or for more information, contact Bighorn Native Plant Society, PO Box 21, Big Horn, WY 82833. JD